Office of Civil Defense
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Protective Structures Division
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MINIMUM TECHNICAL REQUIREMENTS FOR FAMILY SHELTERS

I General

The purpose of these minimum technical requirements is to establish official standards which will provide the basis for effective family shelter designs. Minor modifications to suit local building codes may be necessary. However, care must be taken not to diminish the protective characteristics of the shelter.

II Terminology

A. Fallout Shelter. A structure, room or space designed to protect its occupants from fallout gamma radiation, and offer a protection factor of at least 100.

B. Protection Factor. A factor used to express the relation between the amount of fallout gamma radiation that would be received by an unprotected person and the amount received by one in a shelter. (For example, an unprotected person would be exposed to 100 times more radiation than a person inside a shelter when the protection factor is 100.)

C. Blast-resistant Shelter. A shelter meeting the requirements of II A and designed to protect its occupants against the effects of blast, and associated initial nuclear and thermal radiation, for a design overpressure of at least 25 pounds per square inch.

D. Limited Blast-resistant Shelter. A shelter meeting the requirements of II A and designed to protect its occupants against the effects of blast, and associated initial nuclear and thermal radiation, for a design overpressure of at least 5 pounds per square inch.

E. Dual Purpose Shelter. A shelter having a normal use which would not appreciably interfere with its use in emergency.

F. Family Shelter. A shelter designed for use of a household group up to about 10 persons.

III Space Requirements

Shelters shall allow at least 10 square feet per occupant, but in no case shall they be less than 25 square feet in total. The minimum clear height shall be not less than four feet. The minimum volume shall be not less than 40 cubic feet per person, but in no case less than 100 cubic feet in total.

IV Ventilation Requirements

A. Provision shall be made to: (1) prevent the buildup of vitiated air in any shelter to a level hazardous to its occupants; and (2) prevent the creation of musty conditions in dual-purpose shelters during any period of non-shelter use.

B. Shelters of the outside underground or aboveground type designed for four or more occupants shall have mechanical air blowers. Smaller shelters may use movable or static head ventilators, but in on case shall the vent pipe have an inside diameter of less than three inches.

C. Mechanical air blowers are optional in basement shelters which are otherwise properly ventilated. Effectively placed vent ports may be used for this purpose. These ports shall provide at least 20 square inches of opening per person, but in no case shall be less than 80 square inches in total.

D. Mechanical ventilation systems shall include air intake and exhaust vents and shall be capable of providing at least three cubic feet per minute of fresh outside air per shelter occupant.

E. Mechanical air blowers must be capable of being manually operable.

F. Ventilation intake and exhaust pipes shall have an inside diameter of at least three inches when mechanical air blowers are used. Intake and exhaust pipes shall be designed to prevent the infiltration of particles with a minimum diameter of 50 microns.

G. Engine generator sets for emergency power shall have separate vents and be heat-isolated from the main shelter chamber. Special consideration must be given to the installation of engine generator sets and fuel tanks to minimize hazards from exhaust gases and fire.

V Basic Structural Requirements

A. In general, conventional methods of design and construction for concrete, wood, steel, brick, structural tile and other products will be followed. Variations from conventional methods shall be theoretically and experimentally demonstrated as being capable of carrying design loads. Allowable stresses and/or load factors as defined in the applicable codes shall be used.

B. In areas subject to natural hazards (earthquakes, hurricanes, et.) provisions shall be made to prevent structural damage by any of these natural events.

VI Construction Requirements

A. Shelters designed for construction by the owner on a "do-it-yourself" basis shall be designed with particular care so that a reasonably intelligent person can properly construct it without great delays or frustration, and with normally available tools.

B. Proper consideration shall be given to insure the shelter interior will remain reasonably dry. When necessary, such items as perimeter and subgrade drainage, dampproofing and waterproofing shall be accomplished.

C. The finished structure shall have a demonstrated useful life of at least 10 years unless it is otherwise specified. In no case shall a finished structure have a useful life of less than five years.

D. Entranceways for shelters shall be not less than two feet in width and two feet in height. Entranceways for dual-purpose shelters shall be consistent with the dual-purpose use, but in no case shall be less than those standards just mentioned.

E. Hazardous utility lines such as steam and gas shall not be located in the shelter area unless provision is made to eliminate said hazards before the shelter is occupied.

F. Appropriate provisions shall be made for the use of ordinary battery-operated radios. This may require installation of suitably-designed antennas.

G. Provision shall be made for the prevention of infestation of the shelter by insects, rodents or other pests.

H. Shelters offering resistance to blast shall not use construction materials that are of frangible nature. The use of these materials in fallout shelters is discouraged.

I. The interior surfaces of shelters offering resistance to blast which are susceptible to dusting shall be painted, coated, or otherwise treated to eliminate this possibility.

J. Shelters offering resistance to blast shall not have false ceilings, loosely-supported fixtures or other elements (such as open storage shelves) likely to create flying debris in the event of shock. The use of such items in fallout shelters is discouraged.

K. In areas subject to high ground water conditions, provisions shall be made to prevent flotation of the shelter.

VII Fire Resistance

A. All shelters shall be constructed to minimize the danger of fire from both external and internal sources.

B. Structural components of a shelter shall have a fire resistance rating of at least one hour. This requirement does not preclude the use of, for shielding purposes, earth or sand-filled bags of a fire resistant nature. It also does not preclude the use of wood-sheathed structural components filled with non-combustible materials such as sand, earth, or masonry.

C. Exterior surfaces of shelters offering resistance to blast shall not be ignitable by the thermal pulse associated with the range of the design overpressure. This shall be determined by methods approved by the Office of Civil Defense.

D. Shelters offering resistance to blast with entranceways to existing buildings shall be provided with closures which will heat-isolate the shelter chamber from the associated building. These closures shall also prevent the infiltration of noxious gases.

E. Shelters offering resistance to blast shall have air-intake systems located to minimize the chances of heated air or noxious gases from outside fires being drawn into the system.

VIII Radiation Shielding

A. The protection factor of a fallout shelter shall be determined by methods approved by the Office of Civil Defense.

B. In the calculation of the protection factor, the radiation dose contribution to the shelter occupants coming from the entranceways, ventilation ducts or other openings in the shelter's barriers shall be considered.

C. For basement fallout shelters, a standard residence of the one-story rambler type with all basement walls having one foot exposure aboveground may be used for calculative purposes. However, in those cases where greater exposure of the basement walls is contemplated, the mass thickness of the barriers of the basement shelter shall be appropriately increased or other provisions made to insure that the protection factor of the shelter will be at least 100.

D. Entranceways shall be properly designed to prevent the infiltration of fallout particles and to reduce the fallout gamma radiation hazard through the use of principles of geometry and/or barrier shielding.

E. In shelters offering resistance to blast, the shielding required to adequately reduce the initial gamma and neutron radiation shall be calculated at the range of the design overpressure, using methods approved by the Office of Civil Defense. At this range, the inside dose from initial radiation shall not exceed 20 rad.

IX Blast Resistance

A. The blast resistance of a shelter and its components shall be calculated by methods approved by the Office of Civil Defense.

B. Shelters offering resistance to blast shall be capable of withstanding the design overpressure without structural collapse or serious injury to the occupants. The equipment associated with the shelter such as vent pipes, doors, and other blast-sensitive items shall be designed to perform satisfactorily at the same overpressure range.

C. In shelters offering resistance to blast, openings to the atmosphere shall be provided with appropriate devices to prevent a build-up of pressure within the shelter so that its occupants are subject to no greater than 5 psi.

X Services

A. Provisions shall be made for a potable shelter water supply. The total quantity available shall not be less than 3-1/2 gallons per occupant.

B. Water storage containers shall be non-frangible unless special provision is made to minimize the possibility of breakage.

C. In fallout shelters, water shall be stored in the shelter itself or in nearby, readily accessible areas of the building in which the shelter is located.

D. In shelters offering resistance to blast, water shall be stored (1) in suitable containers within the protected area or (2) in containers outside the shelter, in which case storage tanks and associated piping shall be able to sustain the design overpressure without leakage.

E. Provisions shall be made for the collection and disposal of garbage, trash, and human waste in such a way as to preclude the creation of unsanitary conditions or offensive odors.

F. Appropriate electrical outlets using normally available power shall be installed in dual-purpose shelters. Battery operated lights and radios may be used in other shelter types.